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February 28 to March 1, 2012
Iqaluit, NU

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

In fall 2011, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) included Atlantic Walrus (*Odobenus rosmarus rosmarus*) in their Call for Bids to update the status report in preparation for a re-assessment of this species. Fisheries and Oceans Canada (DFO), as the primary generator and archivist of information on marine species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species is undertaken. To that end, DFO held a peer review meeting on 28, 29 February and 1 March 2012 in Iqaluit, Nunavut, to peer review information relevant to the COSEWIC status assessment for Atlantic walrus. Meeting participants were from DFO Science and Species at Risk programs, relevant wildlife management boards, aboriginal organizations and communities, and COSEWIC sub-committees. In addition, the status report authors and an external expert from Greenland participated in the review. During the meeting, participants discussed a range of topics including calving, mortality, diet, catch history, movements, distribution and numbers, features walrus need in their environment to survive, threats, and special significance Atlantic walrus hold for Inuit.

This Proceedings report summarizes the relevant discussions from the meeting and is available on the DFO Canadian Science Advisory Secretariat Website at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

SOMMAIRE

À l'automne 2011, le Comité sur la situation des espèces en péril au Canada (COSEPAC) a inclus le morse de l'Atlantique (*Odobenus rosmarus rosmarus*) dans son appel d'offres concernant la mise jour du rapport de situation en prévision d'une réévaluation de la situation de cette espèce. Pêches et Océans Canada (MPO), en tant que principal producteur et archiviste de l'information sur les espèces marines, doit fournir au COSEPAC la meilleure information disponible pour permettre à ce dernier d'évaluer de façon précise la situation des espèces visées. À cette fin, le MPO a organisé une réunion du 28 février au 1er mars 2012 à Iqaluit, au Nunavut, pour procéder à l'examen par les pairs de l'information pertinente à l'évaluation de la situation du morse de l'Atlantique par le COSEPAC. Les participants à la réunion représentaient les programmes scientifiques et des espèces en péril du MPO, les conseils de gestion des ressources fauniques compétents, les organisations et collectivités autochtones et les sous-comités du COSEPAC. Les auteurs du rapport de situation et un expert externe venu du Groenland ont également participé à cet examen. Au cours de la réunion, les participants ont discuté d'une variété de sujets, notamment le vêlage, la mortalité, le régime alimentaire, l'historique des captures, les déplacements, la répartition et le dénombrement, les caractéristiques nécessaires à la survie des morses dans leur environnement, les menaces et l'importance particulière du morse de l'Atlantique dans la culture inuite.

Le présent compte rendu résume les discussions pertinentes qui ont eu lieu durant la réunion et est disponible sur le site Web du Secrétariat canadien de consultation scientifique du MPO, à l'adresse suivante : http://www.dfo-mpo.gc.ca/csas-sccs/index-fra.htm.

INTRODUCTION

In April 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Atlantic walrus (*Odobenus rosmarus rosmarus*) as Special Concern. COSEWIC intends to update its status report and re-assess walrus in the near future. In anticipation of this Fisheries and Oceans Canada (DFO) held a peer review meeting on 28, 29 February and 1 March 2012 in Iqaluit, Nunavut, for the purpose of ensuring that COSEWIC has the best available information for its assessment (see Terms of Reference, Appendix 1). During the meeting, participants discussed a range of topics relevant to walrus in Canada including calving, mortality, diet, catch history, movements, distribution and numbers, features walrus need in their environment to survive, threats, and special significance for Inuit.

The meeting was attended by experts (Appendix 2) from DFO Science and Species at Risk programs, the Government of Nunavut, Nunavut Wildlife Management Board (NWMB), Nunavik Marine Region Wildlife Board (NMRWB), Torngat Secretariat, Nunavut Tunngavik Incorporated, Makivik Corporation, 15 Nunavut communities, two Nunavik communities, Greenland Institute of Natural Resources, COSEWIC ATK and marine mammal subcommittees, and the status report authors. Two local interpreters provided simultaneous translation services. The meeting generally followed the agenda in Appendix 3.

This Proceedings report summarizes the relevant meeting discussions. Place names mentioned in the document are shown in Figure 1.

DISCUSSION

Following introductions, the Chair provided introductory remarks including an explanation of the purpose of the meeting. This was followed by four presentations that described the wildlife species assessment process in Canada.

WILDLIFE SPECIES ASSESSMENT PROCESS

Overview
Presenter: Sam Stephenson, DFO Species at Risk Program

The first presentation provided an overview of the process used to assess, designate and list wildlife species in Canada and the status of walrus in relation to that process.

COSEWIC is a committee of experts that assesses and assigns wildlife species to risk categories according to their potential risk of extinction or extirpation from Canada. Each wildlife assessment is made on the basis of a status report that is written by one or more authors on contract to COSEWIC for the particular assessment. The status report contains the best available science and Aboriginal or community knowledge relevant to assessing a wildlife species' risk of extinction or extirpation including its basic biology, distribution in Canada, population sizes and trends, habitat availability and trends, and threats to the species and its habitat. COSEWIC has subcommittees that review and edit each status report. When the status report is considered complete, it is distributed to all COSEWIC members who use the report as the basis for their discussions and decision about the risk category to which a wildlife species should be assigned. COSEWIC assessments are guided by the precautionary principle which means that the lack of full scientific certainty about the status of a species does not justify delaying or avoiding actions that would minimize threats to that species.

Figure 1. Map of the eastern Canadian Arctic and western Greenland showing place names mentioned in the text.

In April 2006, COSEWIC assessed Atlantic walrus. All populations were combined for the assessment because COSEWIC thought there was not enough information available to assess them individually. Walrus were given a status designation of Special Concern due to gaps in knowledge, relatively small population sizes based on available estimates of abundance, and the lack of management plans. Following the COSEWIC assessment, DFO held consultations in a number of communities in Nunavut and Nunavik to ask people whether they supported listing of walrus as Special Concern under the *Species at Risk Act*. Almost everyone consulted said "No". Inuit thought that the decline in walrus numbers reported by COSEWIC was not supported by hunters' observations or the available scientific evidence, thus a Special Concern designation was not warranted. The federal government decided to delay making a listing decision until a harmonized listing process had been worked out with the NWMB and the NMRWB. A Memorandum of Understanding (MOU) between the Federal Government and the Boards has been signed with the NWMB but not yet with the NMRWB.

COSEWIC plans to re-assess the status of walrus in Canada in the near future. To that end, in late January 2012 the Committee selected two co-authors to update the status report. The purpose of this meeting was to help the co-authors by reviewing the most up-to-date scientific information relevant to the COSEWIC assessment. All participants were encouraged to contribute their knowledge of walrus as it relates to the assessment.

COSEWIC status report
Presenter: Bruce Stewart, 2006 and 2012 COSEWIC status report author

All available published information was used for the 2006 status report as well as summarized information from people who had handled walrus or conducted surveys in the past. Researchers identified gaps in knowledge and uncertainties associated with past surveys. The co-authors will now update the 2006 status report with new information available since then. The report will include both scientific and local knowledge on a range of topics including walrus biology, population sizes and trends, distribution, habitat use, threats and limiting factors, protection and status. During the next assessment COSEWIC will assess walrus populations individually if enough information is available. Knowledge gaps will be identified and COSEWIC will help the co-authors identify sources of aboriginal traditional knowledge (ATK) and prepare maps. DFO will provide information on its research. Meeting participants encouraged DFO to share all available information, whether complete or not, with the co-authors and COSEWIC. The first draft of the report is due in November 2012 after which the report will go through many reviews and any errors will be corrected.

The 2006 COSEWIC status report summarized the ATK available at that time. The co-authors will update the status report with ATK published since that time and information obtained from talking with people who harvest walrus. The importance of sharing knowledge of walrus during this meeting was stressed, as well as Inuit contacting the co-authors after the meeting if there is any further information to share. Incorporating oral history into the status report from people outside of this meeting will be a challenge. Meeting participants noted the importance of contacting people in Igloolik and Hall Beach because they hunt walrus year-round. Due to budgetary constraints the co-authors are not able to visit people in communities to gather information. Instead they will depend on information collected by people who are in a better position to interpret it, including the Igloolik Pilot Project of the Nunavut Coastal Resource Inventory. The meeting participants reported that Inuit believe that walrus are currently not at risk.

COSEWIC Aboriginal Traditional Knowledge Subcommittee
Presenter: Dean Trumbley, COSEWIC ATK subcommittee co-chair

The COSEWIC ATK subcommittee is composed of two co-chairs and ten members who help to incorporate traditional knowledge into COSEWIC wildlife species assessments. ATK is a world view or way of knowing that includes ecological, utilitarian, social, and spiritual values. It consists of long-term descriptive information held by elders and resource users about the biology of a species that is passed down orally over many generations or published in reports, as well as present-day information collected on Aboriginal lands. The ATK subcommittee is looking for information on aboriginal names of species, species distribution, movement patterns, habitat types and health, changes in population size, body condition noticed in harvest, species interaction, potential threats, and existing aboriginal management. COSEWIC does not need detailed information on cultural significance, medicinal, or spiritual use as it will not benefit the wildlife assessment process.

The use of ATK in COSEWIC assessments follows several guiding principles. Aboriginal communities are presumed to be the primary bodies to facilitate access to ATK in species assessment. Access to ATK is subject to local laws, protocols, and practices. To use ATK in a species assessment, permission must be secured from the ATK holders. ATK is to be treated as public knowledge only with the approval of the ATK holders, in culturally appropriate ways. ATK is to be given equal recognition and value with Western Science and Community Knowledge.

The ATK sub-committee does not have the budget to look at all wildlife species being assessed so every species is initially scored using a decision matrix. For those species with the highest scores (highest priority), a knowledgeable Aboriginal person or organization investigates sources of ATK that should be examined and produces a source report. The next step in the ATK portion of the overall process would be development of an assessment report. The ATK subcommittee developed their process based on consultations with Aboriginal groups including a North Elders workshop held in Rankin Inlet in July 2009. In the case of walrus, a source report was recently drafted and will be finalized sometime in March or April 2012. A working group within the ATK subcommittee has been struck to help with integrating the walrus ATK into the status report.

Some participants encouraged the ATK subcommittee to collect information about walrus from all knowledge holders. The ATK subcommittee does not have the resources necessary to do that so better communication with all jurisdictions and people is needed to gather/incorporate ATK. This meeting is an excellent opportunity for Inuit to share their knowledge of walrus so that it can be included in the COSEWIC assessment.

COSEWIC Marine Mammal Subcommittee
Presenter: Andrew Trites, COSEWIC marine mammal subcommittee member

Once the status report co-authors have written the status report, the marine mammal subcommittee will review it. The role of the subcommittees is to help COSEWIC decide which risk category is most appropriate for each assessed species. COSEWIC uses the status report as the basis of its assessment, in particular three types of information in the report: (1) factors that limit population growth of a species, (2) population size, and (3) whether the population is stable, decreasing, or increasing in size. To assist with the assessment, COSEWIC would like more information on hunting patterns and any changes in hunting patterns over time. COSEWIC would also like to know where people think walrus go when they leave an area.

This meeting gives participants the opportunity to contribute to the COSEWIC assessment by sharing their knowledge of walrus with the status report co-authors and with the ATK and

marine mammal subcommittee members present. The purpose of this meeting is not to determine a risk category for walrus, which is COSEWIC's role, or a listing decision, which is the federal government's responsibility. The federal government has the authority to make the final decision about whether walrus should be listed under the *Species at Risk Act*.

It was noted that COSEWIC is not involved in setting hunting quotas.

Following the initial presentations, participants began to discuss key areas of walrus biology relevant to the COSEWIC assessment.

SPECIES BIOLOGY

COSEWIC used a generation time of 21 years as a yardstick for measuring the population trend of walrus based on the age at which a female gives birth to her first calf and last calf (7 and 35 years, respectively). DFO has no new information to add to the 2006 status report for this section.

Participants reported that in the Inuktitut language there are only two terms used to describe the age of walrus: infants and elderly or old animals. Walrus can start reproducing at age 7 and produce calves every 2-3 years after that. Sometimes a female will give birth to two calves. No one commented about when females might reach reproductive senescence. As males grow older they change to different shades of brown. Walrus are in better condition in the fall and lose fat in spring when mating and pupping occurs. This species is negatively affected by disturbance, especially handling; they flee and may become susceptible to infection or disease. Inuit have reported that walrus stranded on ice in winter and starving will walk across land to reach water. Walrus will also approach people when near death.

CATCH HISTORY
Presenter: Bruce Stewart

There are no historical population estimates for walrus. It is possible to estimate past numbers using available catch records from ship logbooks/records, Hudson Bay Company trade records, RCMP game reports, information held by Wildlife Management Boards, discussions with hunters and elders, oral history accounts, scientific papers and popular accounts. Uncertainties in the data include missing information, especially kill dates and locations, struck-and-loss rates, reporting differences (e.g., between seasons, landed versus killed, types of animal products, ages of animals) and product conversions (e.g., how hide or ivory weights or numbers of Peterhead boatloads convert to numbers of walrus killed).

A few participants commented on how many walrus could be transported in a Peterhead boat. One said that perhaps 40 walrus could be hauled, leaving only a small part of the boat visible above the waterline. Historically, hunters would de-bone walrus so they could take more meat. Another participant reported carrying 10-12 walrus depending on the marine conditions. They would haul de-boned walrus for about 10-15 miles. Penis bones (baculum) were also important to whalers.

Whalers and traders harvested walrus mainly the thick hides but also for ivory, oil, and meat. Three commercial harvest periods have been identified: early commercial whaling (1820-1870), late commercial whaling (1870 to 1910), and land-based trade (1910 to 1928). Whaling started in earnest in Lancaster Sound about 1820, in Cumberland Sound about 1840 and Hudson Bay about 1860 (Figure 1). Between 1885 and 1913, whalers harvested at least 4,000 walrus from Baffin Bay-Davis Strait. And, between 1831 and 1914 they harvested at least 4,750 walrus from northern Hudson Bay-Cumberland Sound. Inuit were involved in these fisheries. Few whalers

visited Foxe Basin or southeastern Hudson Bay. Whalers in the eastern Canadian Arctic harvested primarily bowhead whales until about 1975, when these whales became scarce, and thereafter took more walrus and other species. The value of walrus hides increased dramatically around 1875 but declined around 1914. Very high numbers of walrus were taken in the late 1890s and early 1900s, when as many as 1,400 walrus were taken in one year. A period of land-based whaling followed (1910-1928), when walrus were harvested for trade and subsistence by trading companies and Inuit.

The Inuit subsistence harvest of walrus dates back at least 4,000 years. In the harvest records of ship-based and land-based whaling, it is often difficult to determine which animals were taken primarily by Inuit for subsistence and which for commercial purposes. Better records have been kept for more recent subsistence catches. Inuit have many uses for walrus products (e.g., fermented walrus meat, stomach contents, hides, ivory and bone). Where walrus were more readily available the people often had larger, healthier dog teams and better living conditions. In 1928, killing of walrus was limited to Inuit for their own use. In 1931, the export of walrus hides and un-carved tusks was prohibited and the yearly catch of walrus was limited to seven per family. The introduction of motorized boats, such as Peterheads in the early 1900s and motorized canoes in the 1950s, changed the availability of walrus during the open-water period by enabling hunters to travel farther offshore and to harvest and transport more animals. The transition from dog teams to snowmobiles beginning in the 1960s reduced the need to harvest walrus for dog food.

Before about 1949, there were no records of walrus takes in Foxe Basin probably because the Hudson Bay Company was not often in the community of Igloolik, and Hall Beach was not established until about 1972. Over 7,300 walrus have been taken by Igloolik since 1949 and over 2,600 walrus by Hall Beach since 1972. The walrus harvest was much smaller in southeast Hudson Bay, and most of it taken by Inukjuak in the 1920s and early 1930s. In Northern Hudson Bay and Hudson Strait, there was a gap in harvest statistics during World War II and later between about 1969 and 1973. In Baffin Bay, the harvests fell off in the 1960s as dog teams declined.

Sport hunts began in Nunavut in 1995 and in Salluit (Nunavik) in 1996. Few walrus are taken in sport hunts relative to the subsistence harvests. In Igloolik, sport hunts were suspended for two years, starting in 2008, over concern that walrus were being disturbed.

The status report co-authors would like to know how many walrus Inuit needed historically versus today to support their families. They were able to determine that at least 3,600 were taken from Nunavik and Labrador; at least 4,750 from the Kivalliq (Western Hudson Bay) region and at least 6,600 from the Qikiqtaalik (Baffin) region. They had found reports of at least 36,000 walrus having been taken from the eastern Canadian Arctic. The actual number is likely significantly higher[1].

Not all Nunavut participants agreed that more walrus were taken in the past than now. They pointed out that walrus were not killed unnecessarily, but only according to the needs of the hunter and community. A number of participants said they distrust the accuracy of the Hudson Bay Company records because the Company was only interested in the information from a monetary perspective and there was no accountability or auditing associated with it. In Foxe Basin, more seal pups than walrus are harvested now for dog food compared to the 1960s, however aged walrus meat is still considered a valued food for human consumption. In addition to local consumption, the communities of Hall Beach and Igloolik sell this product to other

[1] Since the meeting, harvest reports for another 4,000 walrus have been located (D.B. Stewart, pers. comm.).

communities, such as Resolute, where increasing destruction of caches by polar bears has made it difficult to produce aged walrus meat. Participants noted the sea ice in Foxe Basin has become thinner and less stable in recent years, making it more difficult to hunt.

A Nunavut participant shared his knowledge of historical catches. While living near Coral Harbour, hunters made three trips to harvest walrus for the winter using five Peterhead boats. Part of the harvest was put away for human consumption and the rest was prepared for dogs. By the time the dog food was gone, seals were basking on the ice and easier to hunt. The participant also gave an example about how walrus react to disturbance on haulout sites. After he had moved to Rankin Inlet in the 1940s or early 1950s about 50 or more walrus were taken by RCMP while en route to Churchill. They continued to shoot in spite of being asked to stop. Only tusks were removed from the animals killed. The haulout site near Chesterfield Inlet had been a gathering place for walrus but following this incident the animals did not return for a long time. Walrus seem to be coming back now.

Nunavik participants felt their region was poorly represented in the historical catch history analysis. They reported that walrus were regularly harvested in Nunavik waters in the 1960s for dog food. Occasionally people would hunt for walrus by boat for periods of up to a month. Fewer animals are currently taken because Nunavimmiut do not use dog teams. Today, hunters travel faster and are more efficient at harvesting walrus. Walrus are not shot until after they leave their haulout sites (*ooglit*), otherwise they will abandon the area. Medium-sized animals are usually taken. The area between Nunavik and Baffin Island is a good place to hunt them. Near Ivujivik, walrus are harvested in September and October. The walrus population in that area appears to be increasing.

The catch history research focused on the eastern Arctic and did not include the St. Lawrence. Historically there were many walrus in the Gulf of St Lawrence but they were hunted to extinction in the 1700s. Today walrus move through the area periodically but do not remain. The co-authors will consider whether there is any value in including the St. Lawrence catch history.

DISTRIBUTION, MOVEMENTS AND DISPERSAL
Presenter: Rob Stewart, DFO walrus researcher

At the time of the 2006 COSEWIC assessment, groups of walrus were identified on the basis of their movements, chemicals in their teeth, and traditional knowledge. Walrus were known to be present in various areas within the Canadian Arctic: in the High Arctic, Foxe Basin, Hudson Strait-Davis Strait, and southern and eastern Hudson Bay. The High Arctic population consists of three stocks (Penny Strait-Lancaster Sound, West Jones Sound and Baffin Bay) that can interbreed fairly well. Since the 2006 COSEWIC assessment the scientific understanding of the overall distribution of walrus has changed little but a better understanding of walrus populations and stocks has started to emerge. Overall, it appears there are two walrus populations in the Canadian Arctic: a High Arctic population and a Central Arctic population. It was noted that most of the scientific studies of walrus undertaken in recent years in Canadian waters and along the western coastline of Greenland are in the process of being reviewed and published.

The Central Arctic population is composed of walrus that reside in Hudson Strait, Davis Strait and Foxe Basin. Some walrus tagged in West Greenland in recent years moved west to Hoare Bay and around Cumberland Sound along the southeastern coast of Baffin Island. One or more walrus tagged by DFO and the Hunters and Trappers Organizations (HTOs) in Qikiqtarjuaq and Pangnirtung moved from Canadian waters east to West Greenland. These movements indicate these walrus are shared between Canada and Greenland. It is likely there are small groups of walrus throughout Hudson Strait and Davis Strait. Recent research has shown that walrus samples from west Greenland and Hudson Strait are different while walrus samples from

Canadian waters in Davis Strait and Hudson Strait are similar. It appears there is a continuous, progressive gradation of genetic differences among walruses between West Greenland, Davis Strait and Hudson Strait (i.e., a clinal distribution). In Foxe Basin, both scientific and traditional knowledge suggest that walrus belong to two stocks: one in the northern region and the other in the central region near Hall Beach and south of there. A participant noted that walrus are returning to the waters around Rankin Inlet.

Walrus also occur in south and east Hudson Bay but researchers know little about these animals. No tagging has been conducted there to date and no current or accurate past estimates of abundance are available. Obtaining walrus samples from harvesters in that area might provide useful information. Heavy metal isotope research conducted on walrus teeth in the past suggested that some individuals born in Foxe Basin near Hall Beach travelled to northern Quebec before eventually returning home. The number of animals that made these movements was equivalent to the proportion needed to prevent genetic differentiation. A participant reported that walrus haulouts on the Quebec side have been active during the past two years.

Some participants reminded others that walrus move according to the seasons in search of food and better conditions and will move beyond the usual places where biologists find them. Known locations of haulout sites are not shared with biologists to prevent walrus from being disturbed while they rest. Walrus can easily smell the presence of a camp nearby and will leave a haulout site in response to a minor disturbance of this nature. If the Mary River mine goes ahead there will be year-round shipments of iron ore through Foxe Basin and Hudson Strait. A participant recommended more research on walrus numbers in Foxe Basin before shipping commences to better understand how that level of traffic would affect walrus migratory routes.

Participants shared their knowledge of the past and current distribution of walrus. In the High Arctic there used to be a walrus congregation area near Pond Inlet in the 1940s. Walrus also used to occur in Lancaster Sound, in the 1980s, in an area bounded by Bylot Island and Borden Peninsula (northern Baffin Island) on the south and Devon Island on the north. No walrus were seen there in summer 2011 although there was evidence that walrus had been using haulout sites in the area. DFO researchers also saw few walrus when they surveyed there in recent years.

Around Frobisher Bay there is a healthy population of walrus. Local people travel to the mouth of the Bay and even towards Pangnirtung to hunt walrus in October or November. In the past two years, walrus have starting moving into Frobisher Bay to within 100 km of Iqaluit, perhaps in response to harassment from shrimp and turbot fishing boats around the islands near the mouth of the Bay.

In Hudson Bay walrus are found around Marble Island, near the community of Rankin Inlet, at some times of the year, but not in July when the water is calm. Farther north, around Chesterfield Inlet, walrus are harvested in spring. There are no haulouts near the community; it takes 45 gallons of gas to reach areas where they can be hunted. Hunters in the Belcher Island usually have year-round access to walrus.

It was noted that walrus also used to occur in eastern Canada along the coasts of Labrador and Newfoundland, as well as in the Gulf of St. Lawrence.

HABITAT

Participants discussed whether there is a link between water depth and dietary preferences. Walrus that inhabit shallow waters are known to eat clams while those that inhabit deeper

waters are thought to be more likely to eat seals (e.g., ringed seal (*Phoca hispida*), bearded seal (*Erignathus barbatus*) and harp seal (*Pagophilus groenlandicus*)). In Greenland, walrus usually occur in shallow water and most eat shellfish (clams) although a few eat seals. Samples obtained from walrus that were eating seals contained high levels of polychlorinated biphenyls (PCBs). It has been commonly reported that only male walrus take seals but some females will too though perhaps only to teach their young or they are scavenging not preying on seals. A participant added that when a walrus is hungry it will eat anything. It was noted that the meat from walrus that live farther off shore tastes different than from those that live near shore; these differences may reflect different groups of walrus. The fat in "offshore" walrus is also firmer and more similar to seal and polar bear (*Ursus maritimus*) fat. One participant noted that walrus that reside in shallow waters are reported to have scratched tusks and shorter whiskers than those in deeper waters. Another participant said that once walrus start eating seal meat, their tusks turn a yellowish colour and become more scratched. Walrus that prey on seal are known to be more aggressive and solitary than those that eat clams. Age does not appear to affect a walrus' preference for eating seals. Many participants reported observing walrus hunting seals in water, but not on ice. Ringed seals appear to be afraid of walruses and avoid using areas frequented by them.

Research conducted in Alaska showed that walrus there are very dependent on sea ice for resting. In Canada this may be less of an issue because most walrus habitat in the eastern Arctic is near land. Participants reported observing walrus mating on land and ice and calving on land and moving pack ice. Off Greenland, research has shown that water depth is more important to walrus than the presence of sea ice. In Canadian waters, the availability of certain water depths for feeding may also be more critical for walrus habitat than the amount of sea ice.

POPULATION SIZES, TRENDS AND UNCERTAINTIES
Presenter: Rob Stewart

The High Arctic population consists of three stocks: Penny Strait-Lancaster Sound, West Jones Sound and Baffin Bay). Surveys were conducted in this region over a period of about nine years using helicopters, boats, and planes (Twin Otter). When possible, Inuit participants have been invited to participate in the surveys. Coastlines were flown to survey haulout sites and walruses on ice. The objective was to count as many walrus as possible to determine the Minimum Known Alive number (MNA). In 1977, the MNA count for Penny Strait-Lancaster Sound was 565. The highest MNA count obtained in recent years was 557 in 2009. Although the survey coverage was incomplete and the number of haul out sites counted varied somewhat over time, this was taken into account by the analysis. Based on the available data there is no evidence of an upward or downward trend in population abundance in Penny Strait-Lancaster Sound. In West Jones Sound the MNA count was 290 in 1977. The highest MNA count obtained in recent years was 404 in 2008. There is no evidence of a statistical trend based on the analysis.

There are a number of well-known difficulties associated with estimating population abundance in walrus. Researchers recognize there are more walrus present than the number counted because some will be "at sea" during the survey and walrus are very difficult to count when they are in water. If a site or area is counted at least twice in a year then a "bounded count" method can be used to produce an estimate of walrus abundance not just a count. The bounded count method uses the two biggest counts for a haulout to estimate the maximum number of walrus expected on that haulout. Another approach to correct for walrus at sea during a survey is to use data from tagged animals to determine what proportion is hauled out at one time. In Alaska and Norway, researchers found that no more than 76% of tagged walrus were hauled out at one time. So to account for those animals, the highest estimates of walrus abundance were adjusted upward by 24%. The 2009 MNA count for Penny Strait-Lancaster Sound was adjusted for walrus "at sea" using the maximum proportion hauled out to produce an estimate of 711 (557-

807) walrus. The 2008 MNA count for West Jones Sound was similarly adjusted to produce an estimate of 492 (404-559) walrus.

Walrus surveys have also been conducted along the eastern coast of Ellesmere Island. In 2009, 571 walrus were counted which produced an estimate of 1,300-1,500 individuals.

The Greenland government flew surveys in northwest Greenland over ice using a grid pattern which produced an estimate of 2,676 (1,146-4,920) walrus. Satellite tags were deployed prior to the surveys to adjust for the number of walrus underwater (i.e., availability bias) and double observers were used during surveys to adjust for observer (i.e., perception) bias.

Some estimates of abundance are available for the Central Arctic population. Early numbers are available from surveys flown in Foxe Basin and some tagging was also conducted there to estimate how many walrus are at sea during surveys. Photographic counts are still underway but a preliminary estimate indicates there may be about 6,000 walrus in Foxe Basin. If "at sea" animals were accounted for then the estimate may increase to about 8,000. These data may change once the counts are completed and reviewed. Surveys conducted along the southeast coast of Baffin Island in 2005-2008 produced counts of 700-1,000 walrus which produced an estimate of about 1,500 animals. Along the coast of West Greenland an estimate of 2,978 (2,597-3,415) walrus was produced based on data collected in 2006 and 2008. They counted 106 walrus (population estimate: 3,162) in 2006 and 211 walrus (population estimate: 1,625) in 2008. In the High Arctic, walrus use haulouts in some years and not in others. A similar changing pattern of haulout use may account for the observed discrepancy between years in West Greenland. It was noted that all the walrus survey results presented were under review before they will be published.

No current population estimates are available for south and east Hudson Bay. In 2006, approximately 270 walrus were seen at Cape Henrietta Maria, at the northwestern corner of James Bay.

A participant reported that adult walrus can stay under the water for almost four hours. Information from older walrus surveys were thought to be unreliable because they are out of date. A participant asked if there was a critical number or a minimum population size that was used as a threshold for deciding if walrus warrants a designation of Special Concern or Threatened under COSEWIC. The presenter responded that the walrus that reside in West Jones Sound, and are estimated to number around 500, seem to be doing fine so that may not represent a minimum threshold for sustainability. A participant said that walrus along the floe edge in Jones Sound number in the thousands and are so numerous that seals have left the area. Other participants provided examples of other species (bowheads, muskox and polar bears) which have undergone noticeable changes in levels of abundance which do not necessarily correspond with scientists' views and data. Researchers were asked to consult with elders and communities before reaching conclusions about their assessments and the population estimates are set in stone.

Participants then shared their local knowledge of walrus abundance. In Foxe Basin, walrus numbers have fluctuated little in recent years although animals have moved farther from the communities, perhaps north to the corner of Foxe Basin. Walrus appear to be healthy and congregate in the fall around the islands, including those off Southampton Island. After incidents of harvesting on haul out sites, walrus stopped using haul out sites. Around Repulse Bay walrus numbers are not thought to be dwindling. Walrus usually come closer to the community in the fall and local hunters will also travel to Southampton Island, White Island and farther north to take walrus. On the Nunavik side of Hudson Strait, more walrus have been seen in recent years and at different times of year than in the past. Walrus appear earlier in the summer, in June

instead of August, and stay in winter, due to climate change, so Inuit can now hunt on an annual basis. At the community of Quaqtaq, walrus can be seen from town in December and from a boat in July. These changes in seasonal distribution may be due to the sea ice being pushed back.

More walrus surveys will be conducted in the future. Researchers are currently deciding if more surveys in Foxe Basin are needed or if they can move forward with surveying Hudson Bay and Hudson Strait. To date, DFO has not conducted walrus surveys near Kimmirut. Baffinland Iron Mines Corporation plans to conduct winter surveys in Hudson Strait in March (2012). DFO plans to test different aircraft than can travel faster and thus survey larger areas. Participants noted that faster aircraft would make it more difficult to count walrus but make it possible to survey a larger area over a relatively short time so all the animals could be counted before they move away. This is important because walrus can travel quickly.

COSEWIC requires information about walrus abundance over a period of three generations in order to assess population trend. The status report authors have compiled historical catch information up to the 1950s which covers three generations. It may be possible to conduct detailed trend analysis for the later time periods when more information was recorded, but likely not for earlier periods.

A participant said that in the past more walrus were present around the Belcher Islands than now and they used to migrate between the Islands and the mainland coast. Hunters had to avoid them while travelling across the bay. Walrus numbers subsequently declined in response to industrial activities (e.g., damming by Hydro Quebec). Inuit would like researchers to study walrus before any further changes/additions are made to dams in the region.

Participants asked whether a total estimate of the numbers of walrus in Arctic waters was available. DFO researchers responded there is no total estimate currently available and there is considerable uncertainty in the available survey results. If there are about 2,700 walrus in the High Arctic population and as many as 9,000 in the Central Arctic population (i.e., about 6,000 in Foxe Basin and as many as 3,000 in West Greenland, some of which may be shared with walrus off the southeast coast of Baffin Island) then there may be as many as 12,000 walrus in the waters of the eastern Canadian Arctic, excluding south and east Hudson Bay for which there are no current estimates.

Whether there has been an increase or decrease in walrus abundance since the 2006 COSEWIC status report is difficult to say with any certainty. Some estimates of abundance reported in 2006 were simply educated guesses so the only legitimate comparison with current estimates would be the 1977 LGL survey results. When the survey techniques used for the older and recent surveys were matched so they could be compared, there was no evidence of changes in walrus abundance. Participants noted that walrus numbers can vary from one year to the next depending on the movements and migration they undertake to meet their dietary needs.

SPECIAL SIGNIFICANCE OF WALRUS

The importance of walrus for Inuit who live in coastal communities in Nunavut and Nunavik was discussed. Historically, Inuit had many uses for walrus products (e.g., meat, hide, ivory and bone). Most families had a dog team so walrus were killed for human and dog consumption. Although many communities do not harvest as many walrus or use as many parts of the animal as they did in the past, they still value this species especially for aged walrus meat. Inuit view traditional foods as akin to medicine. A participant described the process of making aged walrus meat. Dog team racing for quests and races has undergone a resurgence in recent years so

more walrus meat has been taken to feed the dogs. Walrus ivory is used for carving. Communities that have walrus living nearby, such as Hall Beach and Igloolik, continue to hunt this species. Their harvests probably have changed little over the years. Some communities located some distance from walrus are willing to travel to hunt. For example, people in Arviat journey to Marble Island near Rankin Inlet and the people in Kugaaruk travel to Repulse Bay. However, the skin of walrus is tough making it difficult to cut. And when a walrus is butchered, polar bears often eat the meat so it is necessary to bring the meat closer to the community. Consequently, many communities now order their meat from Igloolik rather than conduct their own hunts. There is inter-settlement trade of both walrus meat and tusks.

In northwest Greenland, harvesters filled their quota in October and November 2010 and had to wait until January 2011 before they could hunt again which caused hardship for the harvesters. They use walrus meat for both human consumption and feeding dog teams. Ivory is mostly used for making tools and crafts (e.g., earrings). Tusks are very good for making harpoons and connections used for dog teams. There is currently an import ban on ivory in the European Union so the market for ivory products is restricted to Greenland.

POTENTIAL THREATS

Hunting in Nunavik

Presenter: Kathleen Martin, DFO Science

The landed catch of walrus was presented for subsistence harvests conducted in Nunavik between 1994 and 2010. The source of the data was Makivik Corporation. Salluit is the major harvesting community in Nunavik and Quaqtaq has also consistently harvested walrus over the years. Harvest data comes from the sample collection program to test the meat for trichinosis. A participant from Nunavik said that walrus have been harvested in low numbers throughout much of Nunavik in recent years. Only a few communities hunt near their communities and the numbers presented at the meeting are not accurate. Walrus samples are not always sent for testing if they come from a young animal or if the meat is not intended for human consumption. So the numbers reported through the sample testing program underestimate the actual numbers taken. The low catches reported for 2000-2003 likely reflect poor reporting rather than a decrease in takes although hunting patterns may have changed as fewer people are eating walrus now than in the past. Quaqtaq typically harvests only 6 -12 walrus a year, mostly for fermented meat. No Nunavik communities harvest walrus in significant numbers to feed dog teams.

Sex and age structure information is needed to conduct stock assessments. Harvesters do not report that information in Nunavik because they fear further regulation. Makivik conducted a harvest study between 1989 and 1996/97 which showed the break-down of harvests. Participants noted that younger harvesters are more likely to hunt for walrus with a tusk while the older generation tends to hunt females which have more tender skin.

Integrated Fisheries Management Plans and hunting in Nunavut

Presenter: Amanda Currie, DFO Resource Management

The landed catch of walrus was presented for subsistence harvests conducted in Nunavut between 1997/98 and 2011/12. DFO compiled the information based on reports from HTOs and wildlife officers. Four communities have yearly quotas that were instituted many years ago under the Marine Mammal Regulations: Arctic Bay (10), Clyde River (20), Coral Harbour (60) and Sanikiluaq (10). The rest of the communities are allowed to harvest 4 walrus a year per Inuk. Sport hunts have been conducted in Cape Dorset, Hall beach, Igloolik and Coral Harbour although harvests have not been high for the past few years. Hall beach and Igloolik harvest

significantly more walrus for subsistence than the other communities which typically take fewer than 20 per year. The Nunavik community of Salluit is located within the Area of Equal Use and Occupancy under the Nunavut Land Claims Agreement so their landed catches were also presented.

There is a requirement under the Marine Mammal Regulations and the Nunavut Land Claims Agreement for hunters to report their catches. Participants said that the difficulty of filling out the harvest form and the inadequate remuneration they receive for collecting samples discourages them from providing walrus harvest information and samples to DFO. Additionally, reporting harvest numbers might lead DFO to incorrectly conclude that walrus numbers are dwindling. A participant commented that in his community there are a handful of hunters who refuse to report their catches. His HTO uses the local radio to remind hunters to report and they tried to distribute the reporting booklets last year in an effort to improve reporting. Participants suggested DFO provide one booklet for all species, small enough to fit into a pocket. The presenter noted that DFO has developed new reporting booklets to address concerns previously raised.

Participants noted that in general more females used to be harvested historically. In recent years, more males are harvested in the spring for tusks and males and females are harvested for food in the fall when both sexes are heaviest.

Two walrus working groups (Foxe Basin and Baffin Bay-High Arctic) are currently working together to draft an Integrated Fisheries Management Plan (IFMP) for walrus in Nunavut. Representatives from DFO, Nunavut Tunngavik Incorporated, the Qikiqtaaluk Wildlife Board, and communities of Arctic Bay, Pond Inlet, Grise Fiord, Resolute Bay, Igloolik and Hall Beach participate in this joint effort. The Foxe Basin and Baffin Bay-High Arctic working groups were established in 2007 and 2010, respectively. To date, both groups have developed Terms of Reference, discussed management issues, developed maps, drafted text for the IFMP, and consulted with their communities. The IFMP is still under development. Some concerns raised by the working groups are the same as those mentioned in this meeting: increased shipping and mining, and the need for more scientific information, stock assessment and accurate reporting of landed catches. The value of collecting age and sex information as part of catch reporting, to facilitate stock assessments, has not been discussed by the working groups. In Nunavut, an MOU that sets out requirements for harvest reporting for polar bears was developed among co-managers. It was suggested that a similar approach for walrus might be useful. A participant asked if DFO collected struck-and-loss information from walrus hunters. Struck-and-loss reporting is a requirement of the license for sports hunts. Similar reporting is not required for subsistence hunts, although DFO records struck-and-loss information provided by HTOs. Struck-and-lost rates vary by season, hunting conditions and hunter experience. The 2006 COSEWIC status report reported a maximum of 32% struck and lost for Foxe Basin. No new information was provided by meeting participants on this topic.[2]

The landed catch of walrus was presented for sport hunts conducted in Nunavut and Salluit since 2004. The NWMB, which has the authority to set any non-quota limitations for Total Allowable Harvests, reviews walrus sport hunt applications annually and transmits its approval decisions to DFO. Approved sport hunts are conducted under a DFO license which is required because the hunter is a non-beneficiary. Sport hunts are led by an outfitter from the local community. Specific rules dictate what parts of the killed walrus the hunter can take from the community for personal own use. Cape Dorset and Grise Fiord have requested small numbers for sport hunts while Hall Beach, Igloolik and Coral Harbour have been quite active in

[2] Since the meeting, we have been informed that the Walrus Working Groups report that struck-and-lost rates can range from 5% to 32% (A. McPhee, pers. comm.).

requesting and conducting sport hunts, although a relatively small number of walrus have been landed. During 2008/2009 and 2009/2010, there was a sport hunt moratorium in Igloolik. Kimmirut received approval to conduct sport hunts for three years (2004-2006) and Qikiqtarjuaq for two years (2005-2006) but no walrus were landed. Resolute Bay and Arviat were approved last year for sport hunts but no walrus were taken.

Hunting in Greenland
Presenter: Fernando Ugarte, Greenland Institute of Natural Resources

Walrus occur along the eastern and western coasts of Greenland. The walrus in Northwest Greenland are part of the Baffin Bay stock (Canadian High Arctic population) while those in West Greenland are part of the Davis Strait-Hudson Bay stock (Canadian Central Arctic population).

An overview of walrus research in Greenland was given. Much of the research has been conducted using satellite tagging for a variety of purposes including calibration of aerial surveys and to study walrus movements and stock identity. DNA analysis has also been used to identify stocks as well as sex distribution of the catch. All harvesters who hunt walrus were required to give a piece of meat to the local health clinic to test for trichinosis. Researchers would like to do more intensive sampling in the future. Greenland conducts aerial surveys for different marine mammal species and populations including walrus. In 1998, they interviewed 100 hunters to ask about their catches, climate and other factors. These were not the same interviews conducted for polar bear. It is hoped the report will be completed in 2012. The Greenland government also collects catch statistics for walrus including the location where the animal was killed, the transport hunters used, length of tusks, and whether it was a male or female. There is a lot of seismic exploration in West Greenland for oil and gas. Lately the Greenland government has been using catch report information for environmental impacts assessments so that information about where people hunt can be used in making decisions about the oil industry.

Since 2007, a small satellite tag, which can be deployed without anesthetics, has been used on walrus. The equipment and methods were developed in collaboration with hunters. Researchers work with hunters to conduct a walrus expedition (sledges, boats and dogs) to tag along the ice edge; hunters do the tagging. To assess the effect of the tagging on walrus, tests were conducted on walrus in a colony in the Northeast Greenland National Park. An air gun with an arrow, the same equipment used in West Greenland, was used to deploy a tag on the backs of three identifiable walrus. One of these walrus, estimated to be 20 years of age, had been previously tagged using tusk tags in 1999 and again in 2002. The three walrus continued to behave normally after being tagged. One tag worked for only a short period while the other two worked for one and six months.

New and stronger regulations for walrus, including quotas, came into force in 2007. Walrus can be taken only by full-time hunters, those who derive more than 50% of their income from hunting and fishing. Only small boats and sledges can be used for transport during walrus hunts. Calves and females are protected except in Qaanaaq (Northwest Greenland). Walrus are now found only on the ice; no terrestrial haulouts remain in West or Northwest Greenland. The regulations forbid walrus hunting on land or in summer, though they are not around at that time of year. Walrus must be harpooned before they are shot. Quotas are set in three-year blocks and transfer from one year to the next within that period is allowed. There are wildlife officers in most of Greenland except in the Baffin Bay area.

There are two ways of hunting walrus in Greenland: by boat and from the ice edge. In Davis Strait, Inuit only hunt from boats while in Northwest Greenland they mostly hunt from the ice edge, although there has been more boat hunting in recent years due to deteriorating ice

conditions. It has been difficult to obtain information about struck-and-loss rates because hunters are reluctant to talk about it. So the government has made the assumption that boat and ice hunts have struck-and-loss rates of about 15% and 0%, respectively.

The most recent assessment of walrus by the North Atlantic Marine Mammal Commission (NAMMCO) took place in November 2009. Greenland adjusted the walrus quotas following the 2009 assessment. According to the Convention on International Trade in Endangered Species (CITES), species on Appendix I cannot be exported at all, those on Appendix II require a CITES permit and non-detriment finding (NDF) to allow export, and those on Appendix III require a CITES permit but not an NDF finding. The Greenland government instituted a requirement of an NDF finding for their species on Appendix III including walrus. In 2007, there was a negative finding for walrus in Greenland but this changed to a positive finding in 2011.

Analysis of historical catches in West Greenland, that are part of the Davis Strait-Hudson Bay stock, provided an estimate of about 9,000 walrus in 1900. Those numbers were later depleted by European and North American whalers and have remained relatively stable since 1960. Surveys conducted in 2006 and 2008 estimated walrus in West Greenland to number around 3,000. The science advice for this stock is a removal of 89 animals per year (including animals taken in Canadian waters) which would give a 70% probability of increase (annual replacement yield of 130 walrus (90% Confidence Interval (CI): 61-190)). In Greenland the quota for this stock is 61. Between 2007 and 2011 actual catches ranged between 28 and 62 walrus. The expected catch in Iqaluit, Pangnirtung and Qikiqtarjuaq was about 16 walrus. Assuming a struck-and-loss rate of 15% yields an expected annual removals of 89 (i.e., (61+16) x 1.15) which is within the advice.

In northern Baffin Bay, walrus abundance in 2009 was estimated at 2,700. The modelling suggests this population was severely depleted from about 10,000 walrus in 1900 but there is much greater uncertainty about the historical data than for West Greenland. The science advice for this stock is a removal of 68 animals per year (including animals taken in Canadian waters) which would give a 70% probability of increase (annual replacement yield of 84 walrus (90% CI: 31-140)). In Greenland the quota for this stock is 64. Between 2007 and 2011 actual catches ranged between 60 and 91 walrus. The expected catch in Grise Fiord is four walrus. Assuming a struck-and-loss rate of between zero and 15% yields expected annual removals of 68-78 depending on the struck-and-loss rate used (i.e., (64+4) x 0 or (64+4) x 1.15). An annual removal of 68 is within the advice while an annual removal of 78 is within the replacement yield. After much debate, Greenland decided the combined catches for Greenland and Canada are sustainable for both stocks. New population estimates and diving data will help with re-assessments in the future. It would also help to have sex and age break-down of the landed catch for future assessments.

Various questions and comments were raised about the material presented. The presenter did not know whether the population model used was age based or stage based. Compliance reporting in Greenland is very good. Hunters must provide their catch information for the previous year in order to get a new license. Hunters report their catches to their municipality which forwards the information to the relevant government department. Now hunters realize there is a higher probability of higher catches in the future if they accurately report their harvest information. Along the western coast of Greenland, there are five larger communities (> 1,000 people) and about 20 smaller communities. Most walrus are taken by three communities in Northwest Greenland and another three in West Greenland. The remaining communities take a relatively small number of walrus per year. The walrus harvest is based on a single tag for each animal and only one hunter gets a tag so there is no over-reporting.

Historically there were a lot of walrus haulouts near Sisimiut (central-western Greenland) and a little north of there. Sometime in the first half of the last century those haulouts were abandoned most likely due to hunting. Walrus now haul out on the ice edge offshore. If sea ice continues to recedes, walrus may be forced to haul out on land. That is why no hunts are allowed on land now. The walrus seemed to have moved offshore before tourism became a problem.

One participant questioned why Canada has not joined NAMMCO. As this is a policy question, this topic was not pursued.

A participant asked whether there has been any evidence of skin diseases in walrus as a result of the crash of a U.S. B-52 bomber plane near the Thule Air Base in Northwest Greenland in 1968. The plane, which crashed onto the sea ice, had been carrying atomic bombs which ruptured and dispersed radioactive contamination. There has been no evidence of skin diseases in walrus in the region. The presenter noted that in recent years, tourism, fishing, seismic and drilling exploration have increased, even during winter, along with associated shipping activities. Their effects on walrus have not yet been studied. In response to another question the presenter said he is not aware of any serious volcanic activity in Greenland although sometimes ash arrives from Iceland.

Another participant asked if age or sex is taken into account for the quotas. Only adult males are allowed to be taken from the Davis Strait stock. Most hunters report taking adult males but DNA samples indicate that many females have been taken too. It seems that identifying males from females in the field is more difficult than initially thought. It will take considerable discussion with hunters to determine how to regulate this. Uncontrolled hunting of marine mammals no longer occurs in Greenland as previously reported in COSEWIC reports. The current annual quotas for both walrus stocks along the western side of Greenland are around 60-70. The catch prior to the early 2000s was about 30% higher than this.

Participants discussed whether the 32% struck-and-loss rate that occurs in Canadian waters could be reduced to 15% as it is in Greenland if hunters harpooned first. The 32% rate reported in the COSEWIC status report was an upper limit. In Greenland, 0% was used for ice-based hunts and up to 15% for boat hunts so all the reported loss rates are based on the same studies. That said, if animals are harpooned first it would reduce hunting losses.

Several participants said that the impact of hunting on walrus is quite small relative to other threats.

Nunatsiavut

Presenter: Julie Whalen, Torngat Secretariat

Walrus are rarely seen in the Nunatsiavut region (in Labrador) now. The main role of the Nunatsiavut participant at this meeting was to learn how ATK is used for COSEWIC processes. Based on that information, the Torngat Secretariat and Nunatsiavut Government will determine whether they have relevant information to share with COSEWIC.

Research

Some participants believe that tags cause sickness and disorientation in walrus. DFO researchers indicated that the tags were about the size of a BIC lighter. They were deployed using a harpoon smaller than a seal harpoon which inserted the tag into the skin to a depth of about 1.5". The tags only lasted about three months so they did not provide information on long-term movements. The first drug administered to walrus during tagging was temperamental so they changed to another drug that was effective on walrus in the High Arctic but ineffective on

walrus around southeast Baffin Island. Between 5 and 10 walrus died in response to tagging over the years. In 2007, Canadian researchers stopped using drugs on walrus. Many participants said they do not approve of studies that involve handling and attaching satellite tags to walrus because of the risk of a wound and subsequent infection which could cause disease and death in walrus herds. Researchers said they have found no evidence of the spread of infection from one animal to another from tagging. Another participant commented that walrus occasionally draw blood just by scratching their skin.

Predation

Polar bears and killer whales are known predators of walrus. Polar bears typically hunt around haulout sites and take females and young animals rather than large males. They have been known to kill pregnant females and dig the foetus out of the mother walrus. A participant noticed that as ice has broken up earlier during the past few years in his region, polar bear predation has increased at both walrus haulout sites and the nesting grounds of ducks like eiders (genus *Somateria*). A participant asked whether a haulout site would be abandoned if a walrus is killed there. No one knew for sure. A DFO researcher reported seeing walrus and bears co-existing at Manning Island in Foxe Basin during the past couple of years. Death among walrus is also caused by fighting and from trampling. In recent years, more walrus have been seen in northern Foxe Basin than in the past including a few animals that had been trampled and then taken by bears. Participants predicted that walrus would then avoid those haulout sites.

There was a discussion about a walrus found with a circular wound on its back. It was suggested that the wound may have been the result of a shark attack although some participants doubted whether a shark could bite through a walrus' tough hide. Circular bite marks attributed to sharks have been seen on narwhal in southern Greenland.

Disease

A participant described an incident in which the skin of a tagged walrus in Foxe Basin turned red. The animal was later killed by a hunter near Hall Beach and the meat fed to dogs. No samples from the animal were provided to DFO. He thought that chemicals in the water make walrus more susceptible to disease. At least one other recent case of a sick walrus with reddish skin "lesions" weeping blood has been documented in Foxe Basin. Photographs, but no samples, were taken and shared with the DFO disease specialist in Winnipeg. This may be similar to the recent and unusual reports of sick and lethargic seals and walrus in Alaskan waters. No sick walrus have been reported in Greenland.

In Igloolik, tongue samples from harvested walrus are sent for testing to determine whether an animal contains *Trichinella* worms. In Nunavik, Makivik Corporation has a research centre that tests walrus samples submitted by communities for trichinosis. Female walrus often are not tested because they rarely have trichinosis. The turn-around time for obtaining the test results is typically about 24 hours. Some samples are sent out for further analysis and all received samples are archived. Nunavut participants said that if disease becomes prevalent in walrus there should be a way to quickly test the meat before selling to other communities.

Industrial development

Some participants reported there is an increasing prevalence of underwater acoustic transmitters in Arctic waters and they are having a negative impact on marine mammals. These devices were reported to be used by mining companies (e.g., Baffinland Iron Mines Corporation) and government scientists to conduct their research. Four transmitters were seen being deployed from a ship in Foxe Basin in summer 2011 following which a signal was sent from the

ship to the mooring. These devices are believed to emit sounds audible to marine mammals, but not humans, causing seals and whales to alter their movements and migration routes. Fewer ringed seals, bearded seals and walrus have been sighted in recent years in areas where these devices have been deployed and this change is attributed to the presence of acoustic transmitters.

Participants discussed whether these devices are acoustic transmitters or passive listening devices or oceanographic moorings that do not transmit sound. The seismic arrays used in Greenland waters can produce loud signals. Near Vancouver, powerful sonar devices have caused whales to beach themselves. No Canadian researchers at the meeting were aware of similar transmitters being used in the Canadian eastern Arctic. Along the west coast of Greenland in Davis Strait the Greenland government has deployed passive acoustic receivers to measure currents and water temperature in areas where large whales occur, but those devices do not transmit sounds. They also put out "rowboats" (gliders), which produce a beep sound, to orient in the water so they can see how the water is moving. DFO deployed three passive acoustic and tide pressure devices in Hudson Strait 40 miles off the coast of Nunavik in fall 2011 to record noise pollution.

Seismic activity in Greenland waters was discussed. Testing must be conducted between August 1 and September 30, after narwhal have migrated to Melville Bay and Lancaster Sound. The scale of seismic testing is massive: throughout Baffin Bay and at the northern end of Davis Strait, up to the maritime boundary between Canada and Greenland. Oil drilling has occurred closer to the coastline of Greenland. The biggest threat to marine mammals from oil and gas development is an oil spill from an underground well or from a ship. This would be a problem for Canada because wind and currents would push the spill west into Canadian waters. The Greenland government supports seismic testing because of the economic benefits.

A participant commented that the international community has an interest in the Northwest Passage for maritime passage. It has been stated that the ocean floor must be mapped in order to claim it. Relatively little underwater mapping has taken place in the Canadian archipelago to date, although there has been more farther north. If mapping is undertaken using seismic or even laser, it would produce powerful sounds that would affect marine mammals.

Mining activities in Nunavut and Nunavik are increasing. There are many minerals in Nunavik region and a number of mining efforts are now underway. One of these is the Raglan Mine, near Salluit, that has produced nickel since 1997 and may increase production in the future. Mine concentrate is transported by cargo ship from Deception Bay east through Hudson Strait during the shipping season. Ice break-up from the ship is negatively impacting reproducing seals. Another mine (Nunavik Nickel), south of the Raglan Mine, is expected to start production soon and continue for many years. A mine is also planned for around Quaqtaq.

In Nunavut, some mining is already underway and more is proposed. Baffinland Iron Mines Corporation has proposed to mine and transport iron ore from the Mary River on North Baffin Island in Nunavut. If the project goes ahead, high grade iron ore will be shipped from Steensby Inlet, in northeastern Foxe Basin, to market in Europe using cape-sized vessels with ice-breaking capabilities. The huge ships would transit Foxe Basin and Hudson Strait every two days year-round for 21 years. The Final Environmental Impact Statement has been submitted by Baffinland Iron Mines Corporation to the Nunavut Impact Review Board. It will be distributed to DFO and other jurisdictions for review once it has passed the compliance test. In addition to the Mary River mine, there will be at least one or two mines for precious and other metals, with associated shipping, developed around Rankin Inlet. Mining potential is also being explored in the Belcher Islands and at Roche Bay near Hall Beach. It is possible the Roche Bay mine will be

an even larger project than the Mary River mine. All mining operations that depend on shipping to export their products have the potential to negatively affect walrus.

Participants asked what effects residents of Arctic Bay have noticed during and after the Nanisivik mine closed. While the mine was in operation, concentrate was shipped south between late-May and mid-November for many years[3]. Ships dumped their ballast water after arriving at Nanisivik. During that period, the number of narwhal at the floe edge diminished and seal densities declined. Cod and other fish moved away in response to the dumping of ballast water at the port. Since the mine closed and ship traffic stopped, more narwhal are now using the floe edge and seal and fish densities near the port site have increased. In Nunavik, similar negative effects have been noticed on char in response to loading and unloading at port facilities associated with mining activities and at communities that receive visits from cruise ships.

An increase in shipping traffic in the eastern Arctic, especially large ships on a regular basis, would present problems associated with ballast water. Participants discussed the process by which ships use ballast water and its impact on benthic flora and fauna and the food chain. If ships are from within Canada they don't have to exchange ballast. Ships from outside Canada have to exchange ballast in mid-Atlantic. There are new international regulations that will make it so ships have to hold the ballast water in the ship and treat it there using methods such as heat or light. Ships must meet a certain standard for this, such as killing a certain number or percentage of exotic organisms in the ballast water.

The impacts of the proposed Mary River mine on walrus were discussed. Noise from the gigantic ore-carrying ships along the shipping route, including sonar used to guide the ships, as well as aircraft servicing Steensby Port will disturb walrus in the region. Ballast water dumped from the ore carriers at Steensby Port and its impact on local flora and fauna could also be significant. Other threats to walrus from the project were also touched on. Although some participants thought that walrus would habituate to shipping, most emphasized that walrus are highly affected by disturbance and agreed that shipping activities associated with the proposed number and likely scale of future mining developments in the eastern Arctic would pose a significant threat to walrus.

A participant reported on the impact of sediment turnover from Hydro Quebec activities on the diet of walrus. Another participant asked about possible dangers associated with shipping uranium if a proposed mine near Baker Lake goes ahead. Someone else asked about whether walrus sanctuaries could be established.

Pollution: Contaminants and toxic substances

Dumping of raw sewage by cruise ships in the Arctic was identified as a concern because it could negatively affect filter feeders, like clams, that walrus eat. It was noted that Transport Canada has regulations that control dumping at sea. One participant thought that ships are required to hold sewage until they reach port where they can dump into tanks. Oil spills and shipping accidents that result in vessels sinking were also identified as concerns for walrus due to the potential release of contaminants and pollution. The international Arctic Monitoring and Assessment Programme (AMAP) monitors pollutants in arctic waters. Pregnant women are recommended to not eat walrus because of current levels of contaminants in the meat.

[3] Several visits were made by ore carriers annually in addition to regular sealift operations.

Disturbance from noise or ecotourism

Hunters report that walrus are easily disturbed by noise and will temporarily flee from boat noise regardless of whether it is from large ships or small boats. Tourism is increasing in the Arctic and some tourists now travel to walrus haulout areas in rigid-hulled inflatable boats. It is important to keep those areas undisturbed and for that reason there are regulations against tourists visiting haulout sites. It is not clear how to effectively monitor haulout visitations and enforce the regulations. A participant noted the Nunavut Marine Council has recently been created as called for under Section 15.4.1 of the Nunavut Land Claims Agreement. During preliminary meetings, tourism, development, and ballast water have come up as issues and a symposium will be held next year to discuss these concerns.

As mentioned in the Industrial Development section, noise related to mining activities at port sites and along shipping routes is a significant concern for a species as sensitive as walrus. They may not habituate to ongoing noise pollution and instead move into sub-optimal habitat which could result in detrimental impacts at the stock or population level.

Climate change

Participants wondered whether marine productivity would increase or decrease in response to climate change. A study in Greenland investigated productivity in different years and recorded higher productivity in years with no ice, possibly because the growing season started earlier in those years. However, it was noted that the type of algae would influence whether and how marine productivity increases or decreases according to ice conditions. The discussion was not pursued as no one with oceanographic expertise was available to provide useful information.

Current climate change models predict that in 50 years there will no longer be any sea ice although the models do not take into account other factors, such as volcanic eruptions, that could lead to cooling. Participants were generally concerned about potential impacts of climate change but there is no evidence yet of the effects on walrus in Canadian waters. They may be less significant for walrus than other species such as ringed seals because walrus can, and do, haul out on land. One participant shared that his father said when the seas are rough it is a signal for walrus to start to migrate. This year walrus started to migrate earlier because of the ice melt.

The adaptability of walrus to changing environmental conditions was considered. It often depends on how quickly the environment changes. Walrus can probably adapt to some extent but if the distribution or kind of prey changes then it makes predictions more difficult. Historically, this species lived farther south than it does today, so it appears walrus can live without sea ice so long as they have places to feed and rest.

Invasive species

The threat of invasive species was discussed. The European Green Crab (*Carcinus maenas*), Chinese Mitten Crab (*Eriocheir sinensis*) and some tunicates (Tunicata) that feed shellfish could be a problem because they feed on shellfish, thus may compete with walrus for food. Little information is available on the distribution of those species. They are currently found along the Newfoundland coast so they could become a threat if they get to Hudson Strait where they can easily move to Hudson Bay.

CLOSING REMARKS

Once a report summarizing the meeting discussions has been completed, it will be translated into Inuktitut and French. English and Inuktitut language versions will be distributed to participants and all versions will be posted on the DFO website. All meeting attendees, including the interpreters, were thanked for participating in the meeting.

PERSONAL COMMUNICATIONS

Allison McPhee, DFO Fisheries Management, Central and Arctic region, Winnipeg, MB
D. Bruce Stewart, Arctic Biological Consultants, Winnipeg, MB

APPENDIX 1: TERMS OF REFERENCE

Pre-COSEWIC Peer Review Meeting for Atlantic walrus (*Odobenus rosmarus rosmarus*)

Zonal Advisory Process – Central & Arctic, Gulf, Quebec, Maritimes, Newfoundland & Labrador

28 February to 1 March 2012
Iqaluit, Nunavut

Chairperson: Don Bowen

Context

The implementation of the federal *Species at Risk Act* (SARA), proclaimed in June 2003, begins with an assessment of a species' risk of extinction by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a non-government scientific advisory body that has been established under Section 14(1) of SARA to perform species assessments which provide the scientific foundation for listing species under SARA. Therefore, an assessment initiates the regulatory process whereby the competent Minister must decide whether or not to accept COSEWIC's assessment and add a species to Schedule 1 of SARA, which would result in legal protection for the species under the Act. If the species is already on Schedule 1 of SARA, the Minister may decide to keep the species on the list, reclassify it as per the COSEWIC assessment, or to remove it from the list (Section 27 of SARA).

Fisheries and Oceans Canada (DFO), as the primary generator and archivist of information on marine aquatic species and some freshwater aquatic species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species can be undertaken.

The Atlantic walrus (*Odobenus rosmarus rosmarus*) was listed on COSEWIC's fall 2011 Call for Bids to produce a status report.

Objectives

The overall objective of this meeting is to peer-review information relevant to the COSEWIC status assessment for Atlantic walrus in Canadian waters, considering data related to the status and trends of, and threats to this species inside and outside of Canadian waters, and the strengths and limitations of the information. This information will be available to COSEWIC, the authors of the status report, and the Chairs of the COSEWIC Species Specialist Subcommittee. Output from the peer-review (see below) will be posted on the Canadian Science Advisory Secretariat (CSAS) website.

Specifically, DFO information relevant to the following will be reviewed to the extent possible:

1) Life history characteristics

- Growth parameters: age at maturity and maximum age
- Total and natural mortality rates and recruitment rates (if data is available)
- Fecundity

- Generation time
- Early life history patterns
- Specialised niche or habitat requirements (see also critical habitat and residence)

2) Review of designatable units – See COSEWIC 2008 "Guidelines for Recognizing Designatable Units below the Species Level" at http://www.cosewic.gc.ca/eng/sct2/sct2_5_e.cfm

Discussion on the species will consider available information on population differentiation, which could support a COSEWIC decision of which populations below the species' level would be suitable for assessment and designation.

3) Review the COSEWIC criteria for the species in Canada as a whole, and for designatable units identified (if any) according to the information presented in Appendix 1.

4) Describe the characteristics or elements of the species habitat to the extent possible, and threats to that habitat

It is necessary to scope out the characteristics of a species' critical habitat prior to the COSEWIC assessment, with full identification and quantification occurring at the stage that a recovery strategy is developed. Critical habitat is defined in SARA as "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species". Habitat is defined as "in respect of aquatic species, spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced".

The following guidelines are from the DFO Science Advisory Report "Documenting Habitat Use of Species at Risk and Quantifying Habitat Quality" (http://www.dfo-mpo.gc.ca/csas/Csas/status/2007/SAR-AS2007_038_E.pdf).

a) Describe the "functional properties" that a species' aquatic habitat must have to allow successful completion of all life history stages.

In the best cases, a functional property will include both features of the habitat occupied by the species and the mechanisms by which those habitat features play a role in the survivorship or reproduction of the species. However, in many cases the functional properties cannot be described beyond reporting patterns of distribution observed (or expected) in data sources, and general types of habitat feature known to be present in the area(s) of occurrence and suspected to have functional properties. Information will rarely be equally available for all life history stages of an aquatic species, and even distributional information may be missing for some stages. Science advice needs to be carefully worded in this regard to communicate uncertainties and knowledge gaps clearly.

b) Provide information on the spatial extent of the areas that are likely to have functional properties.

Where geo-referenced data on habitat features identified are readily available, these data could be used to map and roughly quantify the locations and extent of the species' habitat. Generally however, it should be sufficient to provide narrative information on what is known of the extent

of occurrence of the types of habitats identified. Many information sources, including Traditional Ecological Knowledge (TEK) and experiential knowledge, may contribute to these efforts.

c) Identify the activities most likely to threaten the functional properties, and provide information on the extent and consequences of those activities.

COSEWIC's operational guidelines require consideration of both the imminence of each identified threat, and the strength of evidence that the threat actually does cause harm to the species or its habitat. The information from the Pre-COSEWIC assessment should provide whatever information is available on both of those points. In addition the information should include at least narrative discussion of the magnitude of impact caused by the threat when it does occur.

d) Recommend research or analysis activities that are necessary to satisfy the requirements for advice on habitat issues, if needed for the species

Usually knowledge gaps are identified and any recommendations made and enacted at this stage in the overall process could result in much more information being available should a Recovery Potential Assessment (RPA) or recovery planning be required for the species.

5) Describe to the extent possible whether the species has a residence as defined by SARA

SARA s. 2(1) defines Residence as "a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating."

6) Threats

A threat is any activity or process (both natural and anthropogenic) that has caused, is causing, or may cause harm, death, or behavioural changes to a species at risk or the destruction, degradation, and/or impairment of its habitat to the extent that population-level effects occur. Naturally limiting factors, such as aging, disease and/or predation that limit the distribution and/or abundance of a species are not normally considered threats unless they are altered by human activity or may pose a threat to a critically small or isolated population. Distinction should be made between general threats (e.g., shipping activity) and specific threats (e.g., ship strikes), which are caused by general activities.

List and describe threats to the species considering:

- Threats need to pose serious or irreversible damage to the species. It is important to determine the magnitude (severity), extent (spatial), frequency (temporal) and causal certainty of each threat.

- The causal certainty of each threat must be assessed and explicitly stated as threats identified may be based on hypothesis testing (lab or field), observation, expert opinion or speculation.

7) Other

Finally, as time allows, review status and trends in other indicators that would be relevant to evaluating the risk of extinction of the species. This includes the likelihood of imminent or

continuing decline in the abundance or distribution of the species, or that would otherwise be of value in preparation of COSEWIC Status Reports.

Working Paper(s)

Any working paper(s) related to the status of the Atlantic walrus being reviewed at the meeting will be made available to all participants by 14 February 2012.

Expected publications

The key conclusions/recommendations will address the basis for assessing status of the Atlantic walrus to be considered by COSEWIC. The final version of the minutes of the meeting will be part of the CSAS Proceedings series.

Participation

Participation is expected from:

- Relevant DFO sectors and regions
- COSEWIC status report author(s)
- Members of COSEWIC (Co-Chairs and/or SSC experts)
- Aboriginal groups
- Other invited external experts as deemed necessary

COSEWIC Criterion – Declining Total Population

a. Summarize overall trends in population size (both number of mature individuals and total numbers in the population) over as long a period as possible and in particular for the past three generations (taken as mean age of parents). Additionally, present data on a scale appropriate to the data to clarify the rate of decline.

b. Identify threats to abundance— where declines have occurred over the past three generations, summarise the degree to which the causes of the declines are understood, and the evidence that the declines are a result of natural variability, habitat loss, fishing, or other human activity.

c. Where declines have occurred over the past three generations, summarize the evidence that the declines have ceased, are reversible, and the likely time scales for reversibility.

COSEWIC Criterion – Small Distribution and Decline or Fluctuation: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

a. Summarise the current extent of occurrence (in km^2) in Canadian waters.

b. Summarise the current area of occupancy (in km^2) in Canadian waters.

c. Summarise changes in extent of occurrence and area of occupancy over as long a time as possible, and in particular, over the past three generations.

d. Summarise any evidence that there have been changes in the degree of fragmentation of the overall population, or a reduction in the number of meta-population units.

e. Summarise the proportion of the population that resides in Canadian waters, migration patterns (if any), and known breeding areas.

COSEWIC Criterion – Small Total Population Size and Decline and Very Small and Restricted: for the species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

a. Tabulate the best scientific estimates of the number of mature individuals.

b. If there are likely to be fewer than 10,000 mature individuals, summarize trends in numbers of mature individuals over the past 10 years or three generations, and, to the extent possible, causes for the trends.

Summarise the options for combining indicators to provide an assessment of status, and the caveats and uncertainties associated with each option.

For transboundary stocks, summarize the status of the population(s) outside of Canadian waters. State whether rescue from outside populations is likely.

APPENDIX 2: MEETING PARTICIPANTS

NAME	Affiliation / Community
Akkuardjuk, Michel	Arviq Hunters and Trappers Organization (HTO) (Repulse Bay)
Arlooktoo, Kiponik	Mayukalik HTO (Kimmirut)
Arreak, Lazarus (interpreter)	Innirvik Support Services Ltd
Bowen, Don (Chair)	DFO (Science, Maritimes region)
Cleator, Holly	DFO (Science, Central and Arctic region)
Currie, Amanda	DFO (Fisheries Management, Central and Arctic region)
Curtis, Martyn	DFO (SARA, Central and Arctic region)
Delisle-Alaku, Adamie	Makivik Corporation
Hamilton, Jason	DFO (Science, Central and Arctic region)
Hidgon, Jeff	COSEWIC status report co-author
Idlout, Simon	Resolute HTO
Ikkidluak, Elisapee (Interpreter)	Innirvik Support Services Ltd
Imgaut, David	Igloolik HTO
Imgaut, Paul	Nunavut Tunngavik Inc.
Kango, Joshua	Amaruq HTO (Iqaluit)
Kaunak, Levi	Hall Beach HTO
Kilabuk, Patrick	Pangnirtung HTO
Kimmaliardjuk, Eli	Aqigiq HTO (Chesterfield Inlet)
Kruger, Lia	DFO (Science, Central and Arctic region)
Magera, Anna	Nunavut Wildlife Management Board
Martin, Kathleen	DFO (Science, Central and Arctic region)
Natanine, Jerry	Nangmautaq HTO (Clyde River)
Newkingnak, Toomasie	Nattivak HTO (Qikiqtarjuaq)
Ningiuk, Joanassie	DFO (Fishery Officer, Quebec region, Inukjuak)
Nirlungayuk, Gabriel	Nunavut Tunngavik Inc.
Noah, Charlie	Iviq HTO (Grise Fiord)
Oovaut , Johnny	Nunavik Marine Region Wildlife Board
Oyukuluk, Qaumayuq	Ikajutit HTO (Arctic Bay)
Qaunaq, Matthias	Mittimatalik HTO (Pond Inlet)
Sala, Harry	Sanikiluaq HTO
Schneidmiller, Adam	Nunavut Wildlife Management Board
Stephenson, Sam	DFO (SARA, Central and Arctic region)
Stewart, Bruce	COSEWIC status report co-author
Stewart, Rob	DFO (Science, Central and Arctic region)
Tapaungai, Kovianatuliaq	Aiviq HTO (Cape Dorset)
Tarqriasuk, Quitsaq	Ivujivik Hunting, Fishing and Trapping Committee
Tatty, John	Kivalliq Wildlife Board
Trites, Andrew	COSEWIC marine mammal subcommittee
Trumbley, Dean	COSEWIC ATK subcommittee co-chair
Ugarte, Fernando	Greenland Institute of Natural Resources
Whalen, Julie	Torngat Secretariat

APPENDIX 3: MEETING AGENDA

Zonal Pre-COSEWIC Assessment for Atlantic walrus

Salons A and B, Navigator Hotel, Iqaluit, Nunavut

Chairperson: Don Bowen

February 28, 2012

9:00 Prayer and round table introductions

9:10 Opening remarks (D. Bowen)

9:20 Wildlife species assessment process

- Overview (S. Stephenson)
- Status report (B. Stewart)
- COSEWIC Aboriginal Traditional Knowledge Subcommittee (D. Trumbley)
- COSEWIC Marine Mammal Subcommittee (A. Trites)

10:00 Species biology

10:20 Coffee break

10:35 Species biology (continued)

11:45 Lunch break

1:00 Catch history (B. Stewart)

1:30 Distribution, movements and dispersal (high Arctic, central Arctic and southern areas) (R. Stewart)

3:30 Habitat (requirements, trends, knowledge gaps and "residence")

4:30 End of Day 1

February 29, 2012

8:30 Recap of Day 1

8:40 Limiting factors

8:55 Population sizes, trends and uncertainties (R. Stewart)

10:00 Coffee break

10:15 Population sizes, trends and uncertainties (continued)

11:45 Lunch break

1:00 Special significance of walrus

3:15 Coffee break

3:30 Special significance of walrus (continued)

4:30 End of Day 2

March 1, 2012

8:30 Recap of Day 2

8:40 Potential threats (extent, frequency, magnitude and certainty)

- Integrated Fisheries Management Plans and hunting in Nunavut (A. Currie)

10:15 Coffee break

10:30 Potential threats (continued)

- hunting in Nunavik (K. Martin)
- hunting in Greenland (F. Ugarte)
- research

11:45 Lunch break

1:10 Potential threats (continued)

- predation
- disease
- industrial development
- contaminants

3:15 Coffee break

3:30 Potential threats (continued)

- disturbance from noise or ecotourism
- climate change
- invasive species

4:00 Closing remarks

4:30 Meeting adjourns